PRETENSIONING MACHINE FOR MAKING PRESTRESSED CONCRETE BODIES

FIG. 1

FIG. 2

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This invention relates generally to machines for positioning tensioned wires, cables, or like strands, preparatory to casting concrete bodies of the prestressed type. In the past, various concrete bodies, such as slabs, beams, or the like, have been prestressed by casting the same about rods, cables, wires or other strands which have been tensioned. Machines have been proposed for positioning the tensioned strands preparatory to the casting operation. One machine of this type makes use of a platform forming a casting area, and serving to mount pins over which the tensioned strands are engaged. The present invention pertains to machines of this type, and is an improvement over prior machines, particularly in that it makes possible the application of reinforcing strand tensioned by application of relatively high forces, thus making possible the manufacture of prestressed concrete slabs, beams, or like bodies, which have reinforcement of adequate strength that is prestressed to an optimum degree.

Another object of the invention is to provide a machine of the above character which facilitates maintaining high tensioning force upon the strand, while at the same time facilitating the positioning of the tensioned strand to provide the desired location in the concrete body. Additional objects and features of the invention will appear from the following description in which the preferred embodiment has been set forth in detail in conjunction with the accompanying drawing.

Referring to the drawing:

FIGURE 1 is a plan view schematically illustrating a machine in accordance with the present invention.

FIGURE 2 is a side view schematically showing the machine of FIGURE 1.

FIGURE 3 is a plan view illustrating a machine constructed in accordance with FIGURES 1 and 2, and showing in particular the main and secondary carriages.

FIGURE 4 is a cross sectional view of the machine shown in FIGURE 3.

FIGURE 5 is a detail in section illustrating pin means for engaging the tensioned strands.

FIGURE 6 is a cross sectional view taken along the line 6--6 of FIGURE 5.

The machine illustrated in the drawing consists of a flat horizontal slab 10 which can be made of reinforced concrete, and which forms a horizontal area for concrete casting operations. In conjunction with the slab 10 there are provided strand feeding means including the main carriage 11, and the secondary carriage 12. Tracking means is provided for the main carriage whereby it may be moved in opposite directions over the slab 10. Additional tracking means is provided for the secondary carriage, whereby this carriage may be traversed laterally of the slab. While the details of the tracking means may vary, the construction illustrated for the main carriage consists of curbs 14 extending along the sides of the slab 10, and serving to mount the parallel longitudinally extending rails 16. Flanged wheels 17 carried by the main carriage, track upon the rails.

The horizontal frame portion of the main carriage includes the tracking rails 18, which are engaged by the flanged wheels 19 of the secondary carriage 12. As representative of suitable means for moving the main carriage, I have shown lines 21 and 22, such as cables or chains, extending along the sides of the machine. They are shown anchored to the depending side portions 23 and of the main carriage frame, at points 24 and 25. A pair of winding drums 27 are rotatably mounted at one end of the slab 10, and are arranged to be reversibly driven by a motor 28 of the remote control type. A pair of sheaves 29 are mounted at the other end of the slab. The line 22 is reeved over one of the corresponding sheaves 29, and then extends alongside the slab, to the corresponding drum 27 upon which it is wound. Each of the lines 21 likewise extends longitudinally of the slab to the corresponding drum 27, upon which it is oppositely wound. With this arrangement, when the motor 28 is operated, lines 21 and 22 move the main carriage in one direction or the other.

For moving the secondary carriage, a winding drum 31 is rotatably mounted upon one side of the main carriage, and is adapted to be driven in opposite directions by the reversible motor 32. A sheave 33 is rotatably mounted at the other end of the main carriage. Line 34 is anchored to one side of the secondary carriage, and extends to the drum 31 upon which it is wound. Cable 36 is also anchored to the secondary carriage and extends over the sheave 33, and then extends to the drum 31, upon which it is oppositely wound. The circuit for energizing and controlling the motor 32 may include conventional trolley conductors and traveling contactors (not shown).

In addition to the tracking means described above, the depending side frame portions 23 of the main carriage may be provided with rollers 37 which engage the side rails 38.

FIGURE 1 schematically illustrates a reel 41 for supplying a cable, wire, or other reinforcing strand to the machine. Suitable journaling means (e.g., trunnions not shown) are provided for this reel, and in addition the reel is operatively coupled to means 42 whereby a predetermined torque can be applied to resist unwinding rotation. Such torque serves to apply a predetermined amount of tension to the strand as it is supplied to the machine. Means 42 may consist for example of electrical motive means of the adjustable torque type, or a steam engine capable of applying a desired predetermined torque. Other torque devices of the pneumatic and hydraulic type are available, and can be used for this purpose.

It will be noted that the reel 41 is disposed off one end of the machine whereby the strand 43 extends in generally horizontal direction to the secondary carriage 12. Preferably suitable pull-equalizing means is provided between the reel and the machine. Thereupon the strand extends downwardly from the stationary sheaves 44, and is engaged with the vertically movable sheave 46. A weight 47 is carried by the sheave 46, and is of such value as to apply the desired pull to the strand 43. If desired, suitable automatic control means can be employed to adjust the torque of the means 42 in accordance with changes in the position of the sheave 46.

The carriage 12 is provided with means whereby the tensioned strand is guided and applied to pins 51 or like means upon the slab 10. Thus as shown particularly in FIGURE 4, sheaves 52 and 53 are mounted above and below the secondary carriage 12. The upper sheave is carried by the sheave block 54, which is swiveled to turn about a vertical axis. A similar sheave block 56 serves to mount the lower sheave 53, and this block is swiveled to the hollow strut or pipe 57, which extends downwardly from the frame of the secondary carriage. The tensioning reinforcing strand extends over sheave 52, downwardly through the hollow strut 57, and then laterally in engagement with sheave 53.

The secondary carriage is shown provided with weights.
which hold it upon the rails against the pull applied to the strand 43. The character of the pins 51 may depend upon the type of concrete casting operation desired. In the arrangement shown in FIGURES 5 and 6 a pin section 61 is set within a socket 62 provided in the slab 10. A second pin section 63 is attached to section 61, by screw 64. The adjacent end faces 66 and 67 of these pin sections are disposed at an angle to the axis of the pin. The opening through pin section 63 for accommodating screw 64 is sufficiently large whereby when the two pin sections are clamped together, there is some off-setting in one direction as shown in FIGURE 5. A collar or sleeve 68 is positioned about each such pin, and is engaged by the formed reinforcing strand 43. The sleeve can be made of various materials but should have sufficient strength to withstand the crushing effect of the strand. As will be apparent from FIGURES 5 and 6 the off-setting of the pin is in a direction corresponding to the direction of the component force applied to the sleeve 68 by the reinforcing strand. After a concrete body has been cast about the sleeves 68 and the reinforcing strand, and the concrete has hardened, it is a simple matter to remove the pin sections 63, thus freeing the sleeves 68.

Operation of my machine can be summarized as follows: the pins 61 are applied to the main carriage in accordance with the desired reinforcement pattern. The reinforcing strand is reeved through the secondary carriage and anchored adjacent one end of the machine, as indicated at 71. The torque means 42 is placed in operation whereby constant tension of predetermined value is maintained on the reinforcing strand. The reinforcing strand causes movements of the two carriages whereby the strand is applied progressively about the pins, as for example in the manner illustrated in FIGURES 1 and 3. Through-out this operation pull is maintained upon the strand whereby an optimum amount of pretensioning is applied. When the operation has been completed, the cable can be cut and anchored without relieving the tension, and thereafter suitable forms are applied to the slab, and the wet concrete mix is poured to the desired form. After the concrete has hardened, the pins 61 are disassembled and removed, and the cast body or bodies lifted from the slab.

In general, my machine greatly facilitates economic production of prestressed slabs, beams and other concrete bodies. The machine is adaptable to a wide variety of reinforcing patterns, as for example patterns used for prestressed concrete slabs, for beams, for movement where a large number of tensioning strands extend longitudinally of the beam, and patterns employed for slabs or other shapes where it is desirable to extend lengths the tensioned reinforcement in two or more directions. The mounting of the reinforcing strand reel and the tensioning means, off to one end of the machine, greatly facilitates maintenance of the desired tensioning forces, particularly forces which are sufficient for relatively heavy reinforcing strands. Also it simplifies reel loading and unloading operations.

I claim:

1. In a machine for positioning tensioned reinforcing strands preparatory to casting concrete bodies of substantially planar configuration, a bed forming a horizontal area upon which concrete bodies can be cast, strand anchor means disposed adjacent said bed, fixed strand engaging elements disposed on said area, means feeding a reinforcing strand to said horizontal area and spaced from said bed, said feeding means including a main carriage and a secondary carriage, means tracking the main carriage for movements in opposite directions longitudinally of said area, means tracking the secondary carriage on the main carriage for traversing movements in a direction lateral to the direction of movement of the main carriage, means supplying the reinforcing strand under a predetermined tension between said strand anchor means and said strand feeding means, said means supplying the strand being located apart from said carriages, and strand guiding means carried by the secondary carriage and serving to position the tensioned strand about said elements, said last means being movable in any direction over said area by movements of the main and secondary carriages.

2. In a machine for positioning reinforcing strands preparatory to casting concrete bodies of substantially planar configurations, a bed forming a horizontal area upon which concrete bodies can be cast, strand anchor means disposed adjacent said bed, strand engaging elements disposed on said area, means feeding a reinforcing strand to said horizontal area and spaced from said bed, said feeding means including a main carriage and a secondary carriage, means for tracking the main carriage for movements in opposite directions longitudinally of said area, means for tracking the secondary carriage on the main carriage for lateral horizontal traversing movements, means supplying reinforcing strands under predetermined tension between said strand anchor means and said strand feeding means, said means supplying the strand being located apart from said carriages, and strand guiding means carried by the secondary carriage and serving to position the tensioned strand about said elements, said last means being movable in any direction over said area by movements of the main and secondary carriages.

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